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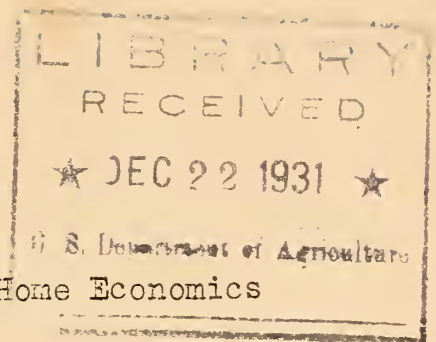
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MEAT IN THE HOUSEHOLD REFRIGERATOR

A Study by Anna M. Pabst, formerly of the Bureau of Home Economics
Summarized by Louise Stanley, Chief.



This study was undertaken to determine the temperatures to be recommended for home refrigeration of meat in order to keep spoilage as low as possible. It was hoped that a rapid method for determination of the progress of spoilage might be obtained, with some measure of the degree of penetration and with information as to whether penetration was in the form of bacteria or decomposition products.

The meat used was a good grade of market top round beef, from inspected and approved animals. It was selected and cut under conditions obtaining in markets of high class doing both wholesale and retail business.

As soon as the sample reached the laboratory it was cut in three inch cubes. Two cubes, one in a covered and one in an uncovered dish, were stored at each of the following temperatures: (F) 35° - 40° - 45° - 50° - 55°. Examination was made of each cube before refrigeration and daily thereafter for four days.

The samples used for bacteriological determinations were small portions from ten different locations on the surfaces of the cubes. The samples were weighed, one gram quantities were triturated with sterile sand in sterile mortars, and the results plated. The average results from twelve series are -

1. Bacterial development markedly checked at temperatures of 40° F. and below.
2. Moderate increase at temperatures up to 45° F.
3. A decided increase at temperatures of 45° F. and above.
4. Growth greater in covered than in uncovered dishes. The increase corresponds to that produced by approximately 5° F. in temperature.

These findings agree with those of other workers in showing that the bacterial count in meat samples varies so much with conditions of growth that they are an inexact method of determining spoilage. These curves, representing as they do the average of twelve series of tests, are smooth. Those based on a single series are more broken. This seems to be due to:

1. Unevenness in distribution of bacteria in the meat and the tendency to form pockets or clumps.

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2. Variation in moisture content.
3. Changes in character of organisms.

The average change in hydrogen ion concentration for the twelve series makes a curve of the same character as the bacterial count, and shows the same variation in an individual series. Average values of both pH and bacterial counts show the general trend of the advance of spoilage and suggest possible explanations of the changes taking place. Neither bacterial count nor pH alone can be taken as a measure of the degree of spoilage or of the quality of meat.

The methylene blue test is of no practical value, because it would be affected by (1) uneven distribution of bacteria, (2) changes in the predominating type, (3) variation in pH, and (4) the presence of enzymes.

The ammonia test was not obtained until spoilage was so advanced as to be perceptible both by sight and odor.

It is of practical importance to know whether the bacteria penetrate the meat or remain largely on the exterior; that is, whether meat showing spoilage on the surface might be usable if the spoiled outer layer were cut off. Histological studies were made to determine this.

A photomicrograph of a large individual section of fresh beef shows practically no bacterial invasion and the fibres are firm and normal in relation to each other. A second photomicrograph, still during the early stages, shows progress in bacterial penetration. The organisms are lined up and invading the spaces between the fibres. The condition of a sample held in an uncovered dish at 55° for four days indicates greater penetration, but a drying out of the surface with a more compact structure resulting. A comparable sample refrigerated at the same temperature in a covered dish showed less firm meat structure and a higher degree of penetration, not only along the outer fibre spaces but into the fibres themselves. The more broken down condition of the fibres which is evident seems to represent the decomposition taking place under these conditions.

Quantitative studies to determine the amount of penetration show the number of bacteria to be relatively small in comparison with the number found on the exterior of the meat, but more homogeneous and composed largely of the types possessing proteolytic properties.

The study demonstrates the need for a more detailed study of types of bacteria present at the different stages of spoilage.

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The first part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom. It is shown that the structure of the atom is determined by the laws of quantum mechanics, and that the laws of quantum mechanics are in agreement with the experimental facts.

The second part of the paper is devoted to a discussion of the application of the theory of the structure of the atom to the study of the properties of the elements of the periodic table. It is shown that the theory of the structure of the atom can be used to explain the periodicity of the properties of the elements, and that it can be used to predict the properties of the elements which have not yet been discovered.

The third part of the paper is devoted to a discussion of the application of the theory of the structure of the atom to the study of the properties of the compounds of the elements. It is shown that the theory of the structure of the atom can be used to explain the properties of the compounds of the elements, and that it can be used to predict the properties of the compounds which have not yet been discovered.

The fourth part of the paper is devoted to a discussion of the application of the theory of the structure of the atom to the study of the properties of the solutions of the elements. It is shown that the theory of the structure of the atom can be used to explain the properties of the solutions of the elements, and that it can be used to predict the properties of the solutions which have not yet been discovered.

The fifth part of the paper is devoted to a discussion of the application of the theory of the structure of the atom to the study of the properties of the solids of the elements. It is shown that the theory of the structure of the atom can be used to explain the properties of the solids of the elements, and that it can be used to predict the properties of the solids which have not yet been discovered.

The sixth part of the paper is devoted to a discussion of the application of the theory of the structure of the atom to the study of the properties of the liquids of the elements. It is shown that the theory of the structure of the atom can be used to explain the properties of the liquids of the elements, and that it can be used to predict the properties of the liquids which have not yet been discovered.

The seventh part of the paper is devoted to a discussion of the application of the theory of the structure of the atom to the study of the properties of the gases of the elements. It is shown that the theory of the structure of the atom can be used to explain the properties of the gases of the elements, and that it can be used to predict the properties of the gases which have not yet been discovered.